

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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First Named Inventor ..... Kasra Khazeni  
Group Art Unit ..... 2877  
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Title: REFLECTANCE SURFACE ANALYZER

**RESPONSE TO OFFICE COMMUNICATION MAILED**

**SEPTEMBER 8, 2006**

To: Mail Stop AF  
Commissioner for Patents  
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**INTRODUCTORY COMMENTS**

This communication is in response to the Office Action mailed September 8, 2006. Please amend the above-identified application as set forth below.

## **AMENDMENTS**

### **In the Claims**

Please amend claims 11, 17, and 18 as set forth below.

1. (Original) An optical measuring system for evaluating a substrate, the system comprising

a laser configured to generate an intensity stabilized light beam;

an optical system for directing the beam to a spot on a substrate being evaluated;

drive mechanism to rotate the substrate;

track and support structures to bring about relative motion of the light beam relative to the surface of the substrate as the substrate rotates;

a detection system configured to receive and detect light reflected from the substrate;

said detection system including polarizers to convert the reflected beam to s and p polarized light and detectors to read the information content of the s and p polarized reflected beams; and,

an elliptical cavity positioned adjacent to the point of impingement by the beam onto the substrate to capture the scattered light from the substrate and to detect the information incorporated into the detected scattered light to provide surface information of the substrate under evaluation.

2. (Original) An optical measuring system in accordance with claim 1 in which a focal point of said elliptical cavity is positioned substantially at the surface being examined.

3. (Original) An optical measuring system in accordance with claim 1 in which a detector is positioned substantially at a focal point of said elliptical cavity.

4. (Original) The optical measuring system of claim 1 in which the laser generates an intensity stabilized wavelength of approximately 532 nm.

5. (Original) The optical measuring system of claim 1 in which said detection system includes a beam splitter to split the reflected beam into two paths and to convert the second split beam into s and p polarized beams.

6. (Original) The optical measuring system of claim 1 in which said elliptical cavity has internal reflecting surfaces to effectively detect substantially all the scattered light of the optical measuring system entering the elliptical cavity.

7. (Original) The optical measuring system of claim 1 in which said elliptical cavity is positioned with a focal point substantially at the surface under examination and the other focal point of said cavity substantially at the detector.

8. (Original) The optical measuring system of claim 4 in which said elliptical cavity is positioned with a focal point substantially at the surface under examination and the other focal point at the detector for said cavity.

9. (Original) An optical measuring system for evaluating a substrate, the system comprising

a laser configured to generate an intensity stabilized light beam in a wavelength of above about 400 nm;

an optical system for directing the beam to a particular spot on a substrate being evaluated;

drive mechanism to rotate the substrate;

track and support structures to bring about relative motion of the light beam relative to the surface of the substrate as the substrate rotates;

a detection system configured to receive and detect light reflected from the substrate;

said detection system including polarizers to convert the reflected beam to s and p polarized light and detectors to read the information content of the s and p polarized reflected beams; and,

an elliptical cavity positioned adjacent to the point of impingement by the beam onto the substrate to capture the scattered light from the substrate and to detect the information incorporated into the detected scattered light to provide surface information of the substrate under evaluation.

10. (Original) An optical measuring system in accordance with claim 9 in which said intensity stabilized light is at 532 nm.

11. (Currently Amended) An elliptical cavity assembly for the detection of surface scattered light in a surface reflectance analyzer, comprising a truncated elliptical cavity to be positioned with the surface under examination substantially at one focal point of the cavity and a detector at the other focal point of the cavity, mirror like walls internally along the inner surfaces of the cavity, and a quarter wave plate at a tilting angle that permits tilting of the wave plate with respect to a beam axis.

12. (Previously Amended) An optical measuring system for evaluating a substrate, the system comprising

- a laser configured to generate an intensity stabilized light beam in a wavelength of above about 400 nm;
- an optical system for directing the beam to a particular spot on a substrate being evaluated;
- drive mechanism to rotate the substrate;
- track and support structures to bring about relative motion of the light beam relative to the surface of the substrate as the substrate rotates;
- a detection system configured to receive and detect light reflected from the substrate;
- said detection system including position sensitive photo-detectors to read information concerning the substrate from the substrate under evaluation; and
- a quarter wave plate at a tilting angle that permits tilting of the wave plate with respect to an axis of the beam.

13. (Previously Amended) An optical measuring system for evaluating a substrate, the system comprising

a laser configured to generate an intensity stabilized light beam in a wavelength of above about 400 nm;

an optical system for directing the beam to a particular spot on a substrate being evaluated;

drive mechanism to rotate the substrate;

track and support structures to bring about relative motion of the light beam relative to the surface of the substrate as the substrate rotates;

a detection system configured to receive and detect light reflected from the substrate;

said detection system including quadrant photo-diodes to read information concerning the substrate from the substrate under evaluation including the directionality of the reflected light; and

a quarter wave plate at a tilting angle that permits tilting of the wave plate with respect to an axis of the beam.

14. (Original) An optical system in accordance with claim 9 in which the detection system includes one or more position sensitive photo-detectors.

15. (Original) An optical system in accordance with claim 1 in which one or more of the detectors comprises a position sensitive photo-detector.

16. (Original) The optical system of claim 15 in which said photo-detectors comprise quadrant photo-diodes.

17. (Currently Amended) An optical measuring system for evaluating a substrate, the system comprising

a laser configured to generate an intensity stabilized light beam;

an optical system for directing the beam to a spot on a substrate being evaluated;

drive mechanism to rotate the substrate;

track and support structures to bring about relative motion of the light beam relative to the surface of the substrate as the substrate rotates;

a detection system configured to receive and detect light reflected from the substrate;

said detection system including polarizers to convert the reflected beam to s and p polarized light and detectors to read the information content of the s and p polarized reflected beams; [[and,]]

compensators ~~in the optical path~~ to compensate for unwanted phase shifts between the s and p beams introduced by other optical components; and

an elliptical cavity positioned adjacent to the substrate.

18. (Currently Amended) The optical measuring system of claim 17, ~~wherein the including an~~ elliptical cavity ~~is~~ positioned adjacent to the point of impingement by the beam onto the substrate to capture the scattered light from the substrate and to detect the information incorporated into the detected scattered light to provide surface information of the substrate under evaluation.

19. (Previously Amended) An optical measuring system for evaluating a substrate, the system comprising

a laser configured to generate an intensity stabilized light beam;

an optical system for directing the beam to a spot on a substrate being evaluated;

drive mechanism to rotate the substrate;

track and support structures to bring about relative motion of the light beam relative to the surface of the substrate as the substrate rotates;

a detection system configured to receive and detect light reflected from the substrate;

said detection system including polarizers to convert the reflected beam to s and p polarized light and detectors to read the information content of the s and p polarized reflected beams; and

a quarter wave plate at an angle of approximately 45 degrees with respect to the p-polarization axis on a tilting plate that permits tilting of the wave-plate with respect to the beam axis.

20. (Previously Amended) The optical measuring system of claim 19 including an elliptical cavity positioned adjacent to the point of impingement by the beam onto the substrate to capture the scattered light from the substrate and to detect the information incorporated into the detected scattered light to provide surface information of the substrate under evaluation.

## **REMARKS**

Applicant respectfully requests reconsideration of this application in view of the following remarks and the above amendments. This response is believed to fully address all issues raised in the Final Office Action mailed September 8, 2006. Furthermore, no new matter is believed to have been introduced hereby.

Claims 11, 17, and 18 have been amended and claims 1-20 remain pending.

### **Allowable Subject Matter**

The outstanding Office Action indicates that claims 1-16, 19, and 20 are allowed. Claim 18 is indicated as allowable if rewritten in independent form including the recitations of the base claim and any intervening claims. Claim 17 from which claim 18 depends has been amended as detailed above and, as further discussed below, claims 17 and 18 are in condition for allowance. Accordingly, it is respectfully submitted that all pending claims 1 through 20 are in condition for allowance.

### **Claim Objections**

The outstanding Office Action objects to claims 11 and 17. In particular, claims 11 and 17 have been objected to for improper recitations. In response, claims 11 and 17 have been amended as detailed above and, as a result, these objections are now moot.

## **Claim Rejection**

Claim 17 stands rejected under 35 U.S.C. §103(a) over US Patent No. 6,483,586 in view of US Patent No. 5,076,696. In response, without limiting the scope of the invention, only in an effort to impart precision to the claims (e.g., by more particularly pointing out the invention, rather than to avoid prior art), and merely to expedite the prosecution of the present application, claim 17 has been amended to in part recite “an elliptical cavity positioned adjacent to the substrate”. As indicated by the Examiner in the outstanding Office Action at page 5, none of the cited references, taken alone or in combination, teach, disclose, or suggest such a recitation. Accordingly, it is respectfully submitted that claim 17 is in condition for allowance.

Further, claim 18 which depends from claim 17 should be allowable for at least similar reasons, as well as additional or alternative elements that are recited therein but not shown in the cited prior art.

## **Conclusion**

Reconsideration and allowance of all claims is respectfully requested. The Examiner is urged to telephone the undersigned if that would expedite prosecution of the application.

Respectfully Submitted,  
Khazeni et al.  
By His Representatives,  
Caven & Aghevli LLC

Dated: September 25, 2006

By:



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